



Quantitative assessment of infection risk from exposure to waterborne pathogens in urban floodwater

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Abstract:

Flooding and heavy rainfall have been associated with waterborne infectious disease outbreaks, however, it is unclear to which extent they pose a risk for public health. Here, risks of infection from exposure to urban floodwater were assessed using quantitative microbial risk assessment (QMRA). To that aim, urban floodwaters were sampled in the Netherlands during 23 events in 2011 and 2012. The water contained *Campylobacter jejuni* (prevalence 61%, range 14- >103 MPN/l), *Giardia* spp. (35%, 0.1-142cysts/l), *Cryptosporidium* (30%, 0.1-9.8oocysts/l), noroviruses (29%, 102-104pdu/l) and enteroviruses (35%, 103-104pdu/l). Exposure data collected by questionnaire, revealed that children swallowed 1.7ml (mean, 95% Confidence Interval 0-4.6ml) per exposure event and adults swallowed 0.016ml (mean, 95% CI 0-0.068ml) due to hand-mouth contact. The mean risk of infection per event for children, who were exposed to floodwater originating from combined sewers, storm sewers and rainfall generated surface runoff was 33%, 23% and 3.5%, respectively, and for adults it was 3.9%, 0.58% and 0.039%. The annual risk of infection was calculated to compare flooding from different urban drainage systems. An exposure frequency of once every 10 years to flooding originating from combined sewers resulted in an annual risk of infection of 8%, which was equal to the risk of infection of flooding originating from rainfall generated surface runoff 2.3 times per year. However, these annual infection risks will increase with a higher frequency of urban flooding due to heavy rainfall as foreseen in climate change projections.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Extreme Weather Event, Food/Water Quality

Extreme Weather Event: Flooding

Food/Water Quality: Pathogen

Geographic Feature:

resource focuses on specific type of geography

Urban

Climate Change and Human Health Literature Portal

Geographic Location:

resource focuses on specific location

Non-United States

Non-United States: Europe

European Region/Country: European Country

Other European Country : Netherlands

Health Impact:

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Foodborne/Waterborne Disease

Foodborne/Waterborne Disease: Campylobacteriosis, Cryptosporidiosis, Giardiasis

Foodborne/Waterborne Disease (other): norovirus; enterovirus

Population of Concern: A focus of content

Population of Concern:

populations at particular risk or vulnerability to climate change impacts

Children

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Time Scale Unspecified